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AI24BTECH11021 - Manvik Muthyapu

Common Data for Questions 19 and 20:

The velocity field of a two-dimensional fluid flow is as follows:

$$u = U_0\frac{x}{L}, v = -U_0\frac{y}{L}$$

Where, U_0 and L are, respectively, the characteristic velocity and length.

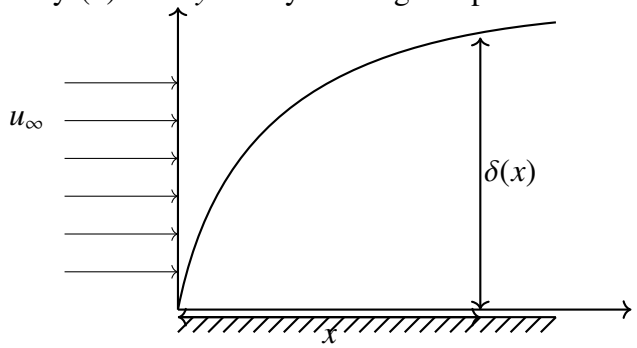
19) If $L = 0.2$m and the resultant of total accelerations in x- and y- directions at $(x = L, y = L)$ is 10m/s^2, the magnitude of U_0 (m/s) is
   a) 1.414
   b) 2.38
   c) 1.19
   d) 11.90

20) The above fluid flow can be described as
   a) rotational and compressible
   b) irrotational and compressible
   c) rotational and incompressible
   d) irrotational and incompressible

Linked Answer Questions

Statement for Linked Answer Question 21 and 22

The boundary layer formation over a flat plate is shown in the figure below. The variation of horizontal velocity (u) with y at any x along the plate in the boundary layer is approximated as: $u = Psin(Qy) + R$



21) The most acceptable boundary conditions are
   a) at $y = 0$, $u = 0$; at $y = \delta, u = U_\infty$; at $y = 0$, $\frac{du}{dy} = 0$
   b) at $y = 0$, $u = U_\infty$; at $y = \delta, u = U_\infty$; at $y = 0$, $\frac{du}{dy} = 0$
   c) at $y = 0$, $u = 0$; at $y = \delta, u = U_\infty$; at $y = \delta$, $\frac{du}{dy} = 0$
   d) at $y = 0$, $u = U_\infty$; at $y = \delta, u = U_\infty$; at $y = \delta$, $\frac{du}{dy} = 0$

22) Expressions for P, Q and R are
   a) $P = 0; Q = 0; R = 0$

b) $P = U_\infty; Q = 0; R = 0$
c) $P = 0; Q = \frac{\pi}{2\delta}; R = U_\infty$
d) $P = U_\infty; Q = \frac{\pi}{2\delta}; R = 0$

C : MATERIALS SCIENCE

Useful Data

Avogadro's number	: 6.023×10^{23} mol^{-1}
Boltzmann's constant (k_B)	: 1.38×10^{-23} J K^{-1}
Electron charge (e)	: 1.602×10^{-19} C
Gas Constant	: 8.314 J mol^{-1} K^{-1}
Electron rest mass	: 9.1×10^{-31} kg
Permittivity of vacuum (ε_0)	: 8.854×10^{-12} F m^{-1}
Planck's constant (h)	: 6.626×10^{-34} J s
Bohr magneton (μ_B)	: 9.27×10^{-24} A m^2
Free space permeability (μ_0)	: $4\pi \times 10^{-7}$ H m^{-1}

1J = 6.242×10^{18} eV
$1texteV = 1.602 \times 10^{-19}$ J
1cal = 4.2 J

1) The number of lattice points in an ideal Perovskite unit cell is
   a) 1
   b) 2
   c) 4
   d) 5
2) A Frenkel defect is
   a) a pair of cation and anion vacancy
   b) a pair of cation interstitial and cation vacancy
   c) a cation vacancy
   d) an anion vacancy
3) The angle between the line vector of a screw dislocation and the Burgers vector is
   a) 0 degrees
   b) 45 degrees
   c) 60 degrees
   d) 90 degrees
4) The addition of a network modifier to silica
   a) produces vacancies
   b) enchances the network structure
   c) disrupts the network structure
   d) increases the viscosity
5) The best semiconductor material for LED in the visible range is
   a) Si
   b) Ge
   c) GaAs
   d) $GaAs_0.6P_0.4$
6) A plain carbon steel sample is water-quenched from 900°C to room temperature. Its microstructure will consist of
   a) pearlite
   b) bainite

c) martensite
d) ferrite and pearlite

7) Graphite at zero Kelvin is a
a) good conductor
b) insulator
c) semiconductor
d) semi-metal

8) A high molecular weight polyethylene has an average molecular weight of $560,000$g/mol. Its average degree of polymerization is
a) $15,000$
b) $18,660$
c) $19,310$
d) $20,000$

9) In which region of the spectra crystal lattice absorption is very significant
a) ultraviolet
b) visible
c) microwave
d) infrared